



# Microbot Push Teardown

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Written By: November Five



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## INTRODUCTION

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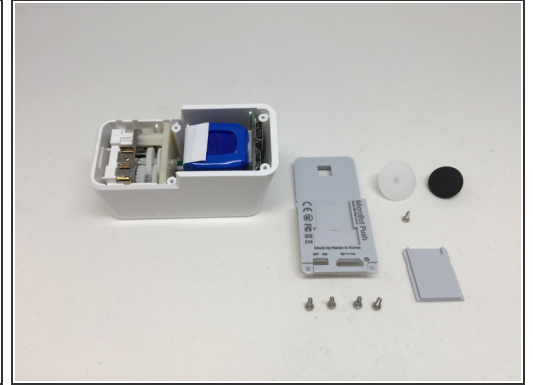
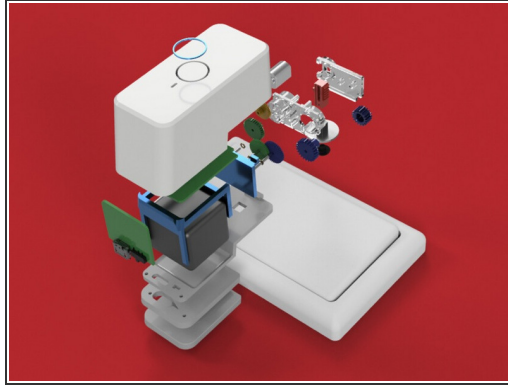
Read the full story on: <https://novemberfive.co/blog/hardware-te...>



### TOOLS:

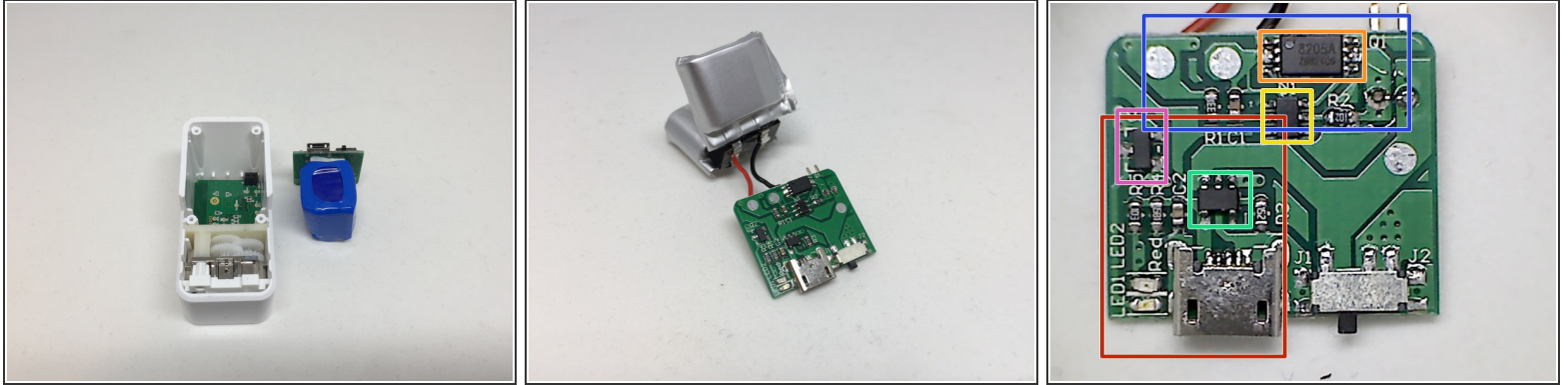
- [Tweezers](#) (1)
  - [T5 Torx Screwdriver](#) (1)
  - [Utility Knife](#) (1)
  - [flat plier](#) (1)
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## Step 1 — Opening the casing



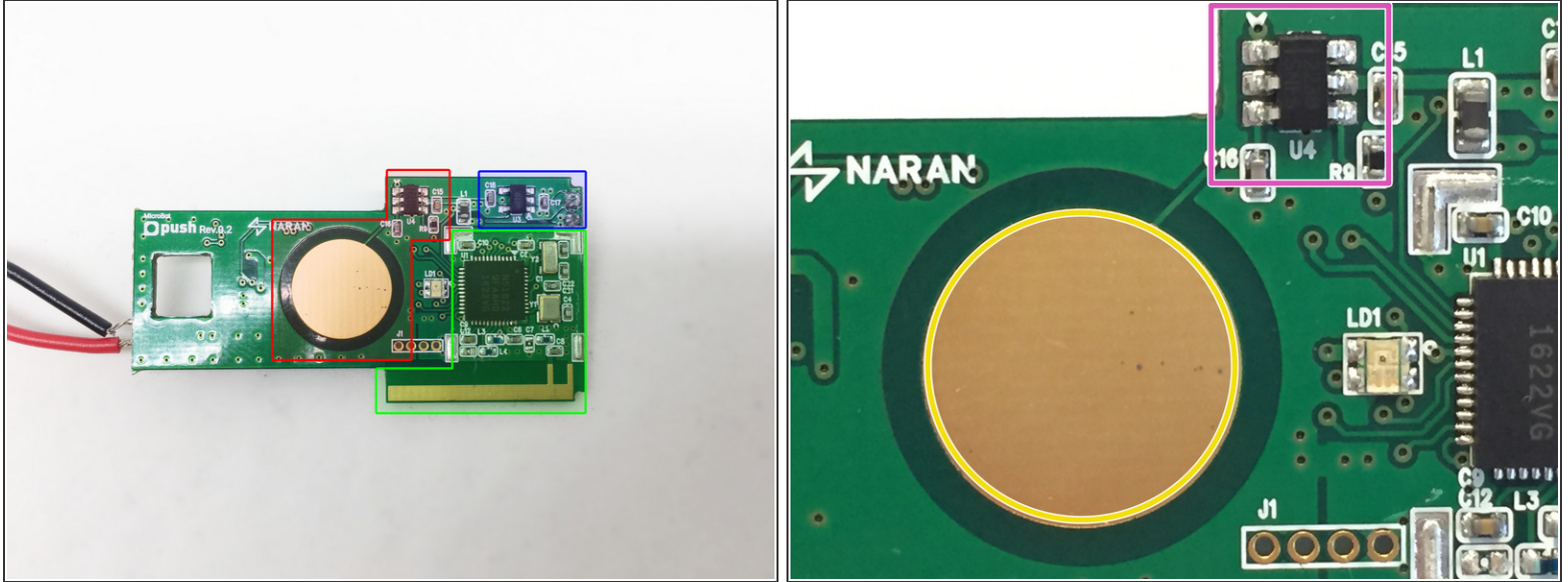
- Removing the 4 Torx screws and 1 regular one beneath the black rubber pad shows us a gearbox, 2 PCBs and a battery

## Step 2 — Battery management



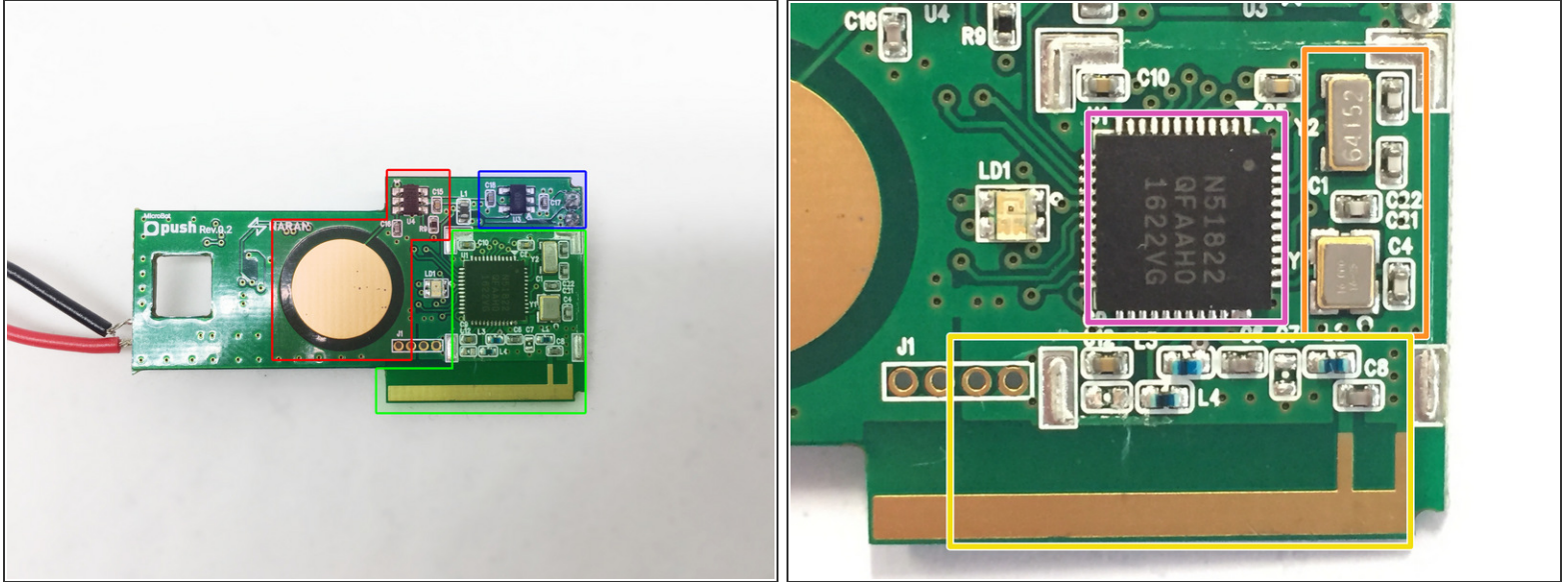
- According to its specs, the MicroBot has a battery life of about one year. The battery is rechargeable, using a regular 5V charger with a micro USB connector.
- Battery charging circuit
  - Charging IC
  - Transistor to control the red and green LEDs next to the USB port, indicating whether or not the battery is fully charged
- Battery protection circuit
  - These types of ICs are used to “sense” the current
  - When the specified current limit has been reached they trigger a switch that will break the current path to the battery. The switch that is triggered in this case is a Dual N-Channel Enhancement Mode Power MOSFET, in this case the 8205A

## Step 3 — Capacitive touch



- The capacitive touch button and matching circuitry (marked in red)
- The big gold circle you see in the middle of the PCB is a capacitive touch button. It's simply an exposed piece of copper
- The TTP223B chip, this chip is a one-key touch pad detector that can detect the touch of a human finger on the touch pad. It does this by using the "Frequency Change" method

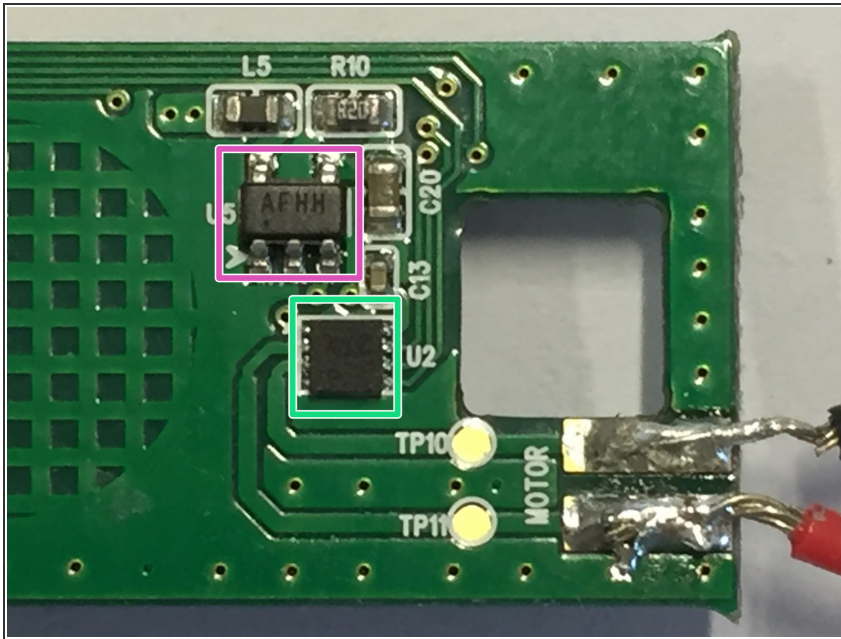
## Step 4 — Bluetooth



- The bluetooth chip and antenna (I had to remove a metal shield to reveal the chip;)
- The bluetooth chip, in this case the nRF51822 Nordic Semiconductors (It's a 2.4GHz ultra low-power bluetooth chip built around a 32-bit ARM® Cortex™ M0 CPU)
- To the right of the nRF51822, you can see two oscillators, one 16MHz and one 32.768kHz (marked in orange), which generate the clock waveforms for the CPU
- On the bottom (marked in yellow) you see the antenna circuitry and the PCB antenna itself. As you can see, they did not use a balun chip, but instead created a matching network using some capacitors and inductors.

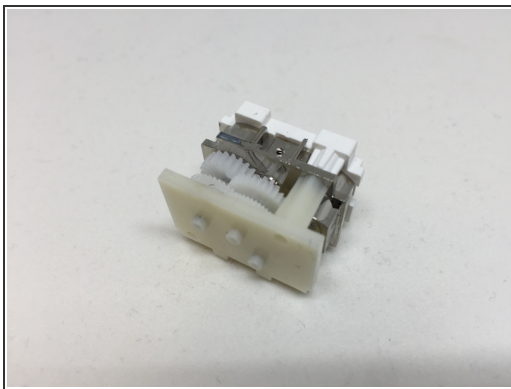


## Step 5 — Driving the motor



- This circuit is located on the back of the PCB
- I could not trace back the datasheets of the actual components used, but after probing the upper IC with an oscilloscope I noticed that this is also a voltage regulator. This one boosts the voltage from 2.5 volts back to 4 volts to power the motor and the motor controller
- Motor driver

## Step 6 — Gearbox



- Opening up the gearbox was fairly simple: I just had to remove two screws to expose the gears and the motor
- If we count all teeth of the gears we come up with a speed reduction of 948.41